California Air Resources Board's
Emissions Inventory Series

Volume 1 Issue 7

CALIFORNIA

SUSTAINED GROWTH AND DIVERSITY

• With close to 34 Million residents in 2000, California is second to no other state in the union when it comes to population. In fact California's population increased by close to 14% between 1990 and 2000.

• California occupies a total area of 163,696 square miles placing it third in the nation surpassed only by Alaska and Texas.

• In addition to its 840 miles of coast line, California has a rich central valley, the Sierra Nevada to the east and desert basins in the southern interior.

• For air quality purposes, California's fifty eight counties are divided into thirty-three different districts and fourteen air basins, in recognition of the diverse topography, climate, and socioeconomics of the state.

• The emissions inventory for on-road mobile sources, therefore must be estimated for each county and for each sub-county which falls in to a different air basin or district. In total, the on-road inventory is estimated for 69 different geographic areas.

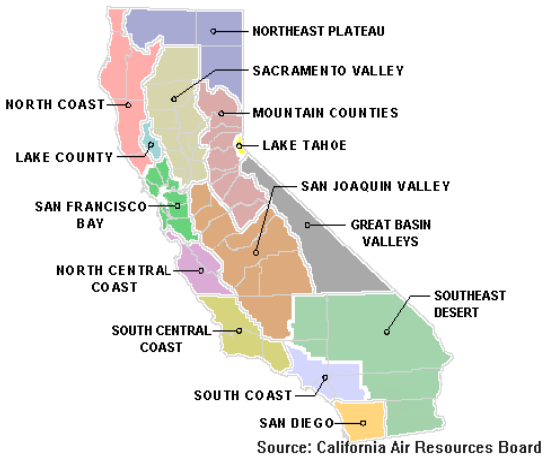
• Prior to the introduction of EMFAC 2000, the on-road motor vehicle fleet was modeled as homogeneous with respect to age.

In actuality, in addition to widely varying ambient temperatures and relative humidity present in each county, the average age of the fleet differs by up to seven model years from county to county with an average of 7.7 years old for passenger cars in Santa Barbara to 15.4 years old in Mendocino. The Statewide average is 11.6 years.

Variation in regional economy may represent differences in vehicle maintenance habits and ultimately Smog Check Failure Rates.

The 2000 U.S. Census reports that Marin County has the highest per capita income in California at $60,967, while Imperial County at $23.359 has the lowest.

California Air Basins



Source: California Air Resources Board

In previous versions of EMFAC, vehicles of the same age were also thought to travel the same miles per year (mileage accrual rate) regardless of where they were registered.

The inventory now utilizes more local data to make each estimate area specific. In this case, odometer data collected during Smog Checks are used to estimate area specific mileage accrual rates.

CALIFORNIA'S AIR POLLUTION CONTROL DISTRICTS

1. Amador County APCD
2. Antelope Valley AQMD
3. Bay Area AQMD
4. Butte County AQMD
5. Calaveras County APCD
6. Colusa County APCD
7. El Dorado County APCD
8. Feather River AQMD
9. Glenn County APCD
10. Great Basin Unified APCD
11. Imperial County APCD
12. Kern County APCD
13. Lake County APCD
14. Lassen County APCD
15. Mariposa County APCD
16. Medocino County APCD
17. Mojave Desert AQMD
18. Monterey Bay Unified APCD
19. North Coast Unified AQMD
20. Northern Sierra AQMD
21. Northern Sonoma APCD
22. Placer County APCD
23. Sacramento Metro AQMD
24. San Diego County APCD
25. San Joaquin Valley APCD
26. San Luis Obispo County APCD
27. Santa Barbara County APCD
28. Shasta County AQMD
29. Siskiyou County APCD
30. South Coast AQMD
31. Tehama County APCD
32. Ventura County APCD
33. Yolo Solano AQMD

CALIFORNIA COUNTIES—QUICK FACTS

The current on-road emissions inventory models also take into account regional differences in the Inspection and Maintenance Program, regional differences in fuel regulations and altitude (Lake Tahoe is considered a high altitude area).

By not assuming homogeneity in the fleet, much more county specific data must be obtained and although the calculations are the same, these calculation must be performed many more times to produce an inventory.

A list of the county specific elements of the current inventory is presented below:

Ambient Temperature
Relative Humidity
Vehicle Population
Fleet Composition
Fleet Growth Rates
Mileage Accrual Rates
Vehicle Age Distribution
Distribution of VMT by Speed
Smog Check Regulations
Fuel Properties
Altitude

Some of these data are provided by local air quality or planning organizations. The rest is obtained from a variety of sources including CALTRNS, the California Department of Motor Vehicles and the Department of Consumer Affairs, Bureau of Automotive Repair.

By utilizing county specific information to the greatest extent possible, the inventory can be used to determine whether proposed air quality control programs benefit all Californians. This is especially important when performing neighborhood assessments or addressing environmental justice issues.

County	Population (2000)	Vehicles per Person	Median Income	Area in Square Miles	Persons per Square Mile
Alameda	1,443,741	0.71	46,795	738	1,956.3
Alpine	1,208	1.21	31,080	739	1.6
Amador	35,100	0.98	37,829	593	59.2
Butte	203,171	0.76	29,367	1,639	124.0
Calaveras	40,554	1.04	34,672	1,020	39.8
Colusa	18,804	0.87	30,464	151	16.3
Contra Costa	948,816	0.76	54,275	720	1,317.8
Del Norte	27,507	0.69	29,044	1,008	27.3
El Dorado	156,299	0.87	44,954	1,711	91.3
Fresno	799,407	0.62	31,587	5,963	134.1
Glenn	26,453	0.85	28,649	1,315	20.1
Humboldt	126,518	0.83	30,426	3,572	35.4
Imperial	142,361	0.77	23,359	4175	34.1
Inyo	17,945	1.10	32,871	10,203	1.8
Kern	661,645	0.66	32,359	7,141	81.3
Kings	129,461	0.54	30,577	1,391	93.1
Lake	58,309	0.93	27,295	1,258	46.4
Lassen	33,828	0.71	36,819	4,557	7.4
Los Angeles	9,519,338	0.61	36.441	4,061	2,344.1
Madera	123,109	0.65	30,804	2,136	57.6
Marin	247,289	0.89	60,967	520	457.6
Mariposa	17,130	1.02	31,178	1,451	11.8
Mendocino	86,265	0.90	32,306	3,509	24.6
Merced	210,554	0.66	29,178	1,929	109.2
Modoc	9,449	0.90	28,174	2,994	2.4
Mono	12,853	0.87	36,276	3,044	4.2
Monterey	401,762	0.66	38,341	3,322	120.9
Napa	124,279	0.83	44.667	754	164.8
Nevada	92,033	0.93	40,347	958	96.1

Highest Population—Los Angeles 9,519,388	Lowest Population– Alpine 1,208
Highest Median Income—Marin $60,967	Lowest Median Income—Imperial $23,359
Largest Area—San Bernardino 20,053 Sq. Mi.	Smallest Area—San Francisco 47 Sq. Mi.
Highest Density—San Francisco 16,526/Sq. Mi.	Lowest Density—Alpine 1.6/Sq. Mi.

California Counties—Quick Facts

County	Population (2000)	Vehicles per Person	Median Income	Area in Square Miles	Persons per Square Mile
Orange	2,846,289	0.73	49,583	789	3,607.5
Placer	248,399	0.83	49,638	1,404	176.9
Plumas	20,824	1.08	35,154	2,554	8.2
Riverside	1,545,387	0.66	36,368	7,207	214.4
Sacramento	1,223,499	0.71	39,461	966	1,266.6
San Benito	53,234	0.70	42,578	1,389	38.3
San Bernardino	1,709,434	0.62	36,876	20,053	85.2
San Diego	2,813,833	0.70	39,427	4,200	670.0
San Francisco	776,733	0.56	43,405	47	16,526.2
San Joaquin	563,598	0.64	35,629	1,399	402.9
San Luis Obispo	246,681	0.79	38,597	3,304	74.7
San Mateo	707,161	0.90	57,267	449	1,575.0
Santa Barbara	399,347	0.75	40,232	2,737	145.9
Santa Clara	1,682,585	0.78	59,639	1,291	1,303.3
Santa Cruz	255,602	0.78	44,607	445	574.4
Shasta	163,256	0.83	32,109	3,785	43.1
Sierra	3,555	0.99	34,941	953	3.7
Siskiyou	44,301	1.00	28,178	6,287	7.0
Solano	394,542	0.71	46,115	829	475.9
Sonoma	458,614	0.82	43,770	1,576	291.0
Stanislaus	446,997	0.68	35,913	1,494	299.2
Sutter	78,930	0.77	33,775	603	130.9
Tehama	56,039	0.76	28,030	2,951	19.0
Trinity	13,022	0.99	27,042	3,179	4.1
Tulare	368,021	0.64	27,622	4,824	75.3
Tuolumne	54,501	0.92	33,810	2,235	24.4
Ventura	753,197	0.78	49,763	1,845	408.2
Yolo	168660	0.70	38,751	1,013	166.5
Yuba	60,219	0.70	26,842	631	95.4
Statewide	**33,871,648**	**0.69**	**39,595**	**163,696**	**217.2**

Newest Pass Car Fleet—Santa Barbara 7.7 years	Oldest Pass Car Fleet—Mendocino 15.4 years
Highest I/M Fail Rate—Trinity 24.4%	Lowest I/M Failure Rate—Mariposa 4.0%
Highest Vehicles/Person—Alpine 1.21	Lowest Vehicles/Person—Kings 0.54

Perhaps the most difficult aspects of preparing county specific emissions inventories lie in the area of estimating ambient temperature, relative humidity and reflecting the effects of topography (grade).

Although the model currently utilizes a county specific, seasonal estimate of temperature and humidity from the National Weather Service, these factors may vary widely within a county.

For example, Los Angeles county contains both coast line and desert. Although a split is made for that portion of Los Angeles which lies within the South Coast, and that which lies in the South East Desert, temperatures may vary by twenty or more degrees across the county.

Road grade also has a significant effect on emissions however the increased load on the vehicle caused by grade is not currently reflected in the inventory. This is because current models are unable to reflect "micro-scale" events. It is only logical to assume that the absence of grade in the models would lead to an underestimation of the inventory for an area like San Francisco.

The need to reflect grade and improve our ability to predict micro-scale emissions events will ultimately require the migration of the inventory to a Geographic Interface System (GIS) as a platform. Under GIS an inventory can be estimated for as small an area as an intersection, to as large an area as the state.

However this will require gathering even more specific data adding to the size and complexity of the models.